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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

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AEROSPACE MEDICINE AND BIOLOGY

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51
LIFE SCIENCES (GENERAL)

19970032164 Engineering Societies Library, New York, NY USA
Nanofabrication and Biosystems: Frontiers and Challenges ***Final Report, 18 Apr. 1994 - 17 Apr. 1995***
Craighead, Harold G., Engineering Societies Library, USA; Aug. 1997; 87p; In English, 8-12 May 1994, Keauhou-Kona, HI, USA
Contract(s)/Grant(s): DAAH04-94-G-0102
Report No.(s): AD-A328739; ARO-32725.1-LS-CF; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche; Abstracts Only; Abstracts Only

The conference has two complementary themes. The first theme Is the emerging trend In the application of micro- and nanofabricated devices to learn more about biological systems. The materials and physics research community has developed powerful and sophisticated methods of probing the electronic, magnetic and mechanical properties of materials on a micro scale. These techniques are beginning to be employed for biological measurements. For example, devices have been fabricated to selectively orient neurons, to elucidate how both fungal and mammalian cells perceive topographical signals, to record action potentials non-invasively from individual cells, and to determine what surface features promote cell and tissue compatibility to biomedical implants.

DTIC
Conferences; Technologies; Mechanical Properties; Magnetic Properties; Anatomy

19970032292 Edgerton, Germeshausen and Grier, Inc., Management Systems, Albuquerque, NM USA
Blast Overpressure Studies with Animals and Man
Johnson, Daniel L., Edgerton, Germeshausen and Grier, Inc., USA; Aug. 1997; 66p; In English; Addendum to AD-A280440
Contract(s)/Grant(s): DAMD17-88-C-8141
Report No.(s): AD-A328877; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report gives the results of Blast Overpressure Studies with animal and man.

DTIC
Animals; Human Reactions

19970032344 Edgerton, Germeshausen and Grier, Inc., Management Systems, Albuquerque, NM USA
Blast Overpressure Studies with Animals and Man
Johnson, Daniel L., Edgerton, Germeshausen and Grier, Inc., USA; Aug. 1997; 36p; In English
Contract(s)/Grant(s): DAMD17-93-C-3101
Report No.(s): AD-A328844; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper contains details of the blast overpressure with animals and man.

Derived from text
Human Beings; Human Body; Blasts

19970033238 Korean Atomic Energy Research Inst., Daeduk, Korea, Republic of
Radiation hormesis in higher plants
Kim, Jae Sung, Korean Atomic Energy Research Inst., Korea, Republic of; Mar. 1996; 62p; In Korean
Report No.(s): KAERI/AR-435/96; DE97-614091; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The most remarkable aspect in the hormesis law is that low dose of harmful agents can produce effect that is diametrically opposite to the effect found with high doses of the same agent. Minute quantities of a harmful agent bring about very small change in the organism and control mechanisms appear to subjugate normal processes to place the organism in a state of alert and repair. The stimulated organism is more responsive to changes in environmental factors than it did before being alerted. Routine functions, including repair and defense, have priority for available energy and material. The alerted organism utilizes nutrients more efficiently, grows faster, shows improved defense reactions, matures faster, reproduces more effectively, has less disease, and lives longer. Accelerated germination, sprouting, growth, development, blooming and ripening, and increased crop yield and resistance to disease are found in plants. Another concept supported by the data is that low doses of ionizing radiation provide increased resistance to subsequent high doses of radiation. The hormesis varies with subject plant, variety, state of seed, environmental and cultural conditions, physiologic function measured, dose rate and total exposure. The results of hormesis are less consistently found, probably due to the great number of uncontrolled variables in the experiments. The general dosage for radiation hormesis in about 100 times ambient or 100 times less than a definitely harmful dose, but these must be modified to the occasion. Although little is known about most mechanisms of hormesis reaction, overcompensation of repair mechanism is offered as on mechanism. Radiation hormesis can provide more efficient use of resources, maximum production of foods, and increased health by the use of ionizing radiation as a useful tool in our technologic society. Efficient utilization of nature's resources demands support to explore the practical application of radiation hormesis.
DOE
Plants (Botany); Radiation Effects; Ionizing Radiation; Stimulation

19970033449 Purdue Research Foundation, IN USA
Structure-Function Analysis of the v-Myc Oncoprotein ***Annual Report, 9 May 1996 - 8 May 1997***
Taparowsky, Elizabeth J., Purdue Research Foundation, USA; Echlin, Deborah, Purdue Research Foundation, USA; Jun. 1997; 24p; In English
Contract(s)/Grant(s): DAMD17-94-J-4037
Report No.(s): AD-A328865; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The biological activities of the v-Myc oncoprotein, including cellular transformation, transcription regulation and apoptosis, depend on the integrity of the v-Myc amino terminus. Analysis of this region using deletion mutagenesis has yielded interesting results. In addition to further defining regions of the amino terminus required for transcriptional activation, a potential inhibitory region of v-Myc transactivation has been identified. New data suggest that the ability of individual deletions to function in transcription as says is not due to different levels of protein expression, supporting an actual difference in the transcriptional abilities of the novel proteins generated by these deletions. The identification and characterization of a protein that specifically interacts with a region of the v- Myc amino terminus has suggested another form of regulation of the v-Myc oncoprotein. This protein, termed OS-9, interacts with a highly conserved and functionally important region of v- Myc called Myc Homology Regi on II. While no effect of OS-9 has been observed on cellular transformation mediated by v-Myc, OS-9 does impact v-Myc transcriptional activation. Transcriptional activity of the v-Myc activation domain is reduced by nearly 75% when OS-9 is overexpressed in cells. This repression does not extend to other activators -- for example, the activation domain of MyoD is unaffected by OS-9. These data point to the interaction of OS-9 with Mvc as being important in regulating the acivities of v-Mvc as a transcription factor.
DTIC
Functions (Mathematics); Functional Analysis

19970033665 Massachusetts Inst. of Tech., Cambridge, MA USA
Larval Dispersal Between Hydrothermal Vent Habitats
Kim, Stacy L., Massachusetts Inst. of Tech., USA; Feb. 1996; 124p; In English
Contract(s)/Grant(s): NSF OCE-90-19575; NSF OCE-93-15554
Report No.(s): AD-A325960; MIT/WHOI-97-05; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Hydrothermal vents are isolated, impermanent habitats that support unique biotic assemblages. The processes by which these communities establish themselves and maintain species identity across geographic gaps are currently unknown. Planktonic vent larvae can be dispersed by buoyant plumes of hot hydrothermal fluid that rise from vents and entrain near bottom water, carrying it several hundred meters above the seafloor before spreading laterally. A standard plume model describes vent plumes well, and predicts that up to 97% of the larvae produced by a vent community will be entrained. Gastropod larvae found in the plume can be identified as specific vent species by scanning electron microscopy. Species level larval identification is a vital step in defining the overall distribution patterns and dispersal pathways of vent larvae. The potential importance of physical flow patterns, geological structure, and biological constraints were compared using a spatially explicit type of mathematical model, called cellular

automata. The results of the model simulations suggest that dispersal in plume flow is vital to long term persistence of vent populations, and that fecundity and larval mortality interact with habitat spacing and vent lifespan to influence the stability of the overall population.
DTIC
Habitats; Larvae; Mathematical Models; Hydrothermal Systems

19970034622 ROW Sciences, Inc., Gaithersburg, MD USA
Short Term Reproductive and Developmental Toxicity of Hexachloroacetone (CAS No. 116-16-5) Administered in Drinking Water to Sprague-Dawley Rats ***Final Report***
May 30, 1997; 409p; In English
Report No.(s): PB97-174577; ROW-Sciences-8989-43; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

The potential toxicity of hexachloroacetone (CAS No. 116-16-5) was evaluated using a short-term reproductive and developmental toxicity screen. The study design was selected to identify the process (development; female reproduction; male reproduction; various somatic organs/processes) that is the most sensitive to HexaChloroAcetone (HCA) exposure. The dose range-findings study was conducted at concentations of 0, 39, 156, 625, and 2500 ppm of HCA in the drinking water for two weeks. However, the 2500 ppm animals were euthanized on SD 9 as a result of extreme decreases in body weight, and feed and water consumption. Based on decreased body weight and water consumption in the 625 ppm males and females, the dose levels of 0, 25, 100, and 400 ppm were selected for the main study, which utilized one group of male rats (10 per dose level) and two groups of female rats designated as Group A (peri-conception exposure, 10 per dose level) and Group B (gestational exposure, 13 per dose level). Control animals received deionized water, the vehicle.
NTIS
Toxicity; Reproduction (Biology); Body Weight

19970034630 Korean Atomic Energy Research Inst., Daeduk, Korea, Republic of
Studies on mutation breeding of hibiscus syriacuse
Song, Hee Sub, Korean Atomic Energy Research Inst., Korea, Republic of; Kim, Jin Kyu, Korean Atomic Energy Research Inst., Korea, Republic of; Lee, Ki Un, Korean Atomic Energy Research Inst., Korea, Republic of; Lim, Yong Taek, Korean Atomic Energy Research Inst., Korea, Republic of; Dec. 1995; 41p; In Korean
Report No.(s): KAERI/RR-1597/95; DE97-614092; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Hibiscus has been known as a national flower of Korea. Hibiscus has such a characteristic of self-incompatibility that all the plants exist as natural hybrids and have heterogeneous genes. Two domestic varieties were propagated. Radiosensitivity of H. syriacus irradiated with gamma ray was investigated in plant cuttings. The plant height was reduced by 45 percent in 5 kR irradiated group compared to control group. The radiation dose of 5 kR could be recommended for mutation breeding of Hibiscus cuttings. Promising mutant lines were selected form the varieties of Hwarang Wolsan 176, 1 Ipyondansim and Emille.
Author(DOE)
Mutations; Students; Breeding (Reproduction)

19970034877 Centre National de la Recherche Scientifique, Toulouse, France
On-line sensitive lightness measurement of cell mass in Saccharomyces cerevisiae culture
Queinnec, I., Centre National de la Recherche Scientifique, France; Guillou, V., Institut National des Sciences Appliquees, France; Uribelarrea, J. L., Institut National des Sciences Appliquees, France; Pareilleux, A., Institut National des Sciences Appliquees, France; 1995; 7p; In English
Report No.(s): CNRS-LAAS-95481; DE97-749184; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

An industrial spectrophotometer was used as a very accurate on-line sensor to investigate fast dynamic changes in yeast culture in the range of 0.5-5 g/l. High sensitive variation in biomass concentration of 0.015 g/l was detected. A fast dynamic response is conduced in a steady state continuous culture of Saccharomyces cerevisiae by an acetate pulse and biomass concentration profile clearly determined by this sensor.
DOE
On-Line Systems; Acetates; Biomass; Saccharomyces; Spectrophotometers; Steady State; Dynamic Response

19970035276

Magnetic orientation as a tool to study the initial stage of crystallization of lysozyme

Ataka, Mitsuo, Natl Inst of Bioscience and Human-Technology, Japan; Katoh, Eriko; Wakayama, Nobuko I.; Journal of Crystal Growth; April 1 1997; ISSN 0022-0248; vol. 173, no. 3-4, pp. 592-596; In English; Copyright; Avail: Issuing Activity

The tetragonal crystals of hen egg-white lysozyme align their c-axis in the direction of a magnetic field. by applying the magnetic field of 1.6 T only over some period during the whole crystallization process, it was possible to know when the crystals sedimented. It was found that crystals grew in solution, and started to sediment on reaching a critical size. We evaluated the critical size to be 1-2 micron by changing the magnetic field strength (0.1-1.2 T) and analyzing the relation between the field strength and the proportion of magnetic orientation.

Author (EI)

Crystallization; Enzymes; Magnetic Effects

19970035491

Design and performance evaluation of a high-resolution small animal positron tomograph

Pavlopoulos, Sotirios, Rutgers Univ, USA; Tzanakos, George; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3249-3255; In English; Copyright; Avail: Issuing Activity

We have used Monte Carlo simulation methods to design and evaluate a small animal Positron Tomograph. The tomograph has an inner diameter of 34.37 cm and a field of view of 20 cm (diameter) transaxially and 6 cm axially. The basic gamma-ray detector unit consists of a partially segmented BGO block made of 18 x 16 crystals of dimensions 3.35 mm x 3.30 mm x 30 mm, read out by a position sensitive photomultiplier tube with crossed anode wires. The design of the block was accomplished with our recently developed Monte Carlo simulation program for PET design, which also was used for the evaluation of the performance of the Tomograph. The rate (trues, randoms, NEC) performance as well as the resolution have been studied and compared to those of other tomographs.

Author (EI)

Computerized Simulation; Monte Carlo Method; Positrons; Radiation Detectors; Tomography

19970035492

First results from a YAP:Ce gamma camera for small animal studies

De Notaristefani, F., Univ of Rome 'La Sapienza', Italy; Pani, R.; Scopinaro, F.; Barone, L. M.; Blazek, K.; De Vincentis, G.; Malatesta, T.; Maly, P.; Pellegrini, R.; Pergola, A.; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3264-3271; In English; Copyright; Avail: Issuing Activity

The YAP (Yttrium Aluminum Perovskite) Camera is a novel gamma camera with intrinsic submillimeter spatial resolution and detection efficiency comparable to a standard Anger camera. At the first stage, it is a miniature gamma camera with a field of view of 4 x 4 cm(sup 2) and is currently utilized for radio tracer studies on small animals. The YAP camera consists of a multicrystal array coupled to a position sensitive photo multiplier tube (Hamamatsu R2486) with a parallel hole collimator. The preliminary results are presented and discussed, in particular the intrinsic characteristics of scintillating array, which are measured, as well as the position linearity and the spatial resolution with a parallel collimator. Images were obtained from (sup 99m)Tc line source and nude Balb C mice, which have been injected with (sup 99m)Tc MDP, a bone-seeking agent. The observed images show the importance of the small-field YAP camera in radiopharmaceutical research.

Author (EI)

Bioengineering; Cameras; Computer Aided Tomography; Gamma Rays; Isotopic Labeling; Radiography; Resolution

19970035496

Investigation of factors affecting detector and geometric correction data in normalization of 3-D PET data

Bailey, Dale L., Hammersmith Hospital, UK; Townsend, David W.; Kinahan, Paul E.; Grootoonk, Sylke; Jones, Terry; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3300-3307; In English; Copyright; Avail: Issuing Activity

Normalization in three-dimensional (3-D) positron emission tomography (PET) comprises two aspects: correction for differential detector response and correction for geometric effects. Comparison of rotating rod source and uniform cylinder data suggests that the position of the source used to correct for sensitivity should be similar to that of the emission data. A plane source method has been devised that uses a moving line source that traverses the transaxial field-of-view, emulating a plane source, but without the problems associated with using a conventional plane source in 3-D (uniformity, scatter, cost, etc.). This device has been used to record high count density acquisitions for direct normalization of emission data and also to examine geometric effects with increasing azimuthal (pi) and polar (theta) angles in the 3-D data set. The data have confirmed observations of two distinct

geometric patterns seen previously in two-dimensional PET: an overall transaxial sensitivity profile that decreases toward the center of the projection and a crystal interference profile that changes with position in the block. Correction for the first geometric component removes a low-sensitivity 'hole' in 3-D PET reconstructions, and correction for the second component removes 'ring' artifacts. The direct normalization approach produces an artifact along the central axis of the scanner. A quantitative index of nonuniformity for 1-pixel-thick annular regions of interest showed a reduction from 60% nonuniformity with no corrections to less than 15% when the plane source data were used to directly normalize the emission data. The moving line source provides high quality data and may be an appropriate normalization device for 3-D PET.
Author (EI)
Positrons; Radiation Counters; Tomography

19970035497
Methods for the correction of vascular artifacts in PET O-15 water brain-mapping studies
Chen, Kewei, Univ of Arizona, USA; Reiman, Eric M.; Lawson, Michael; Yun, Lang–Sheng; Bandy, Daniel; Palant, Anita; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3308-3314; In English; Copyright; Avail: Issuing Activity

The position of the source used to correct for sensitivity in three-dimensional (3-D) positron emission tomography (PET) should be similar to that of the emission data. A plane source method has been developed that uses a moving line source that traverses the transaxial field-of-view, emulating a plane source in 3-D. The method confirms observations of two distinct geometric patterns seen previously in two-dimensional PET. Using the method to make corrections for the first geometric component removes a low-sensitivity 'hole' in 3-D PET reconstructions and correction for the second component removes 'ring' artifacts.
Author (EI)
Blood Flow; Blood Vessels; Brain; Brain Circulation; Cardiovascular System; Hemodynamics; Positrons; Tomography

19970035498
Monte Carlo modeling of coherent scattering: Influence of interference
Leliveld, C. J., Foundation for Fundamental Research on Matter, USA; Maas, J. G.; Bom, V. R.; Van Eijk, C. W. E.; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3315-3321; In English; Copyright; Avail: Issuing Activity

In this study, we present Monte Carlo (MC) simulation results for the intensity and angular distribution of scattered radiation from cylindrical absorbers. For coherent scattering we have taken into account the effects of interference by using new molecular form factor data for the AAPM plastic materials and water. The form factor data were compiled from X-ray diffraction measurements. The new data have been implemented in our Electron Gamma Shower (EGS4) Monte Carlo system. The hybrid MC simulation results show a significant influence on the intensity and the angular distribution of coherently scattered photons. We conclude that MC calculations are significantly in error when interference effects are ignored in the model for coherent scattering. Especially for simulation studies of scattered radiation in collimated geometries, where small angle scattering will prevail, the coherent scatter contribution is highly overestimated when conventional form factor data are used.
Author (EI)
Computer Aided Tomography; Computerized Simulation; Light Scattering; Monte Carlo Method; Water; X Ray Diffraction

19970035499
Investigation of partial volume correction methods for brain FDG PET studies
Yang, J., Univ of California at Los Angeles, USA; Huang, S. C.; Mega, M.; Lin, K. P.; Toga, A. W.; Small, G. W.; Phelps, M. E.; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3322-3327; In English; Copyright; Avail: Issuing Activity

The use of positron emission tomography (PET) in quantitative fluorodeoxyglucose (FDG) studies of aging and dementia has been limited by partial volume effects. A general method for correction of partial volume effects (PVE) in PET involves the following common procedures: segmentation of MRI brain images into gray matter (GM), white matter (WM), cerebral spinal fluid (CSF), and muscle (MS) components; MRI PET registration; and generation of simulated PET images. Afterward, two different approaches can be taken. The first approach derives first a pixel-by-pixel correction map as the ratio of the measured image to the simulated image (left bracket) with realistic full-width at half-maximum (FWHM)(right bracket). The correction map was applied to the MRI segmentation image. Regions of interest (ROI's) can then be applied to give results free of partial volume effects. The second approach uses the ROI values of the simulated 'pure' image (with negligible FWHM) and those of the simulated and the measured PET images to correct for the PVE effect. by varying the ratio of radiotracer concentrations for different tissue components, the in-plane FWHM's of a three-dimensional point spread function, and the ROI size, we evaluated the perfor-

mance of these two approaches in terms of their accuracy and sensitivity to different simulation configurations. The results showed that both approaches are more robust than the approach developed by Muller-Gartner at al., and the second approach is more accurate and more robust than the first. In conclusion, we recommend that the second approach should be used on FDG PET images to correct for partial volume effects and to determine whether an apparent change in GM radiotracer concentration is truly due to metabolic changes.
Author (EI)
Brain; Imaging Techniques; Medical Equipment; Muscles; Positrons; Tissues (Biology); Tomography

19970035502
New axial smoothing method based on elastic mapping
Yang, J., UCLA Sch of Medicine, USA; Huang, S. C.; Lin, K. P.; Czernin, J.; Wolfenden, P.; Dahlbom, M.; Hoh, C. K.; Phelps, M. E.; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3355-3360; In English; Copyright; Avail: Issuing Activity

New positron emission tomography (PET) scanners have higher axial and in-plane spatial resolutions but at the expense of reduced per plane sensitivity, which prevents the higher resolution from being fully realized. Normally, Gaussian-weighted interplane axial smoothing is used to reduce noise. In this study, we developed a new algorithm that first elastically maps adjacent planes, and then the mapped images are smoothed axially to reduce the image noise level. Compared to these obtained by the conventional axial-directional smoothing method, the images by the new method have improved signal-to-noise ratio. to quantify the signal-to-noise improvement, both simulated and real cardiac PET images were studied. Various Hanning reconstruction filters with cutoff frequency = 0.5, 0.7, 1.0x Nyquist frequency and Ramp filter were tested on simulated images. Effective in-plane resolution was measured by the effective global Gaussian resolution (EGGR) and noise reduction was evaluated by the cross-correlation coefficient. Results showed that the new method was robust to various noise levels and indicated larger noise reduction or better image feature preservation (i.e., smaller EGGR) than by the conventional method.
Author (EI)
Algorithms; Cardiovascular System; Nyquist Frequencies; Positrons; Scanning; Signal to Noise Ratios; Tomography

19970035507
Biosensor that uses ion-channel switches
Cornell, B. A., Australian Natl Univ, Australia; Braach–Maksvytis, V. L. B.; King, L. G.; Osman, P. D. J.; Raguse, B.; Wieczorek, L.; Pace, R. J.; Nature; June 5 1997; ISSN 0028-0836; vol. 387, no. 6633, pp. 580-583; In English; Copyright; Avail: Issuing Activity

Biosensors are molecular sensors that combine a biological recognition mechanism with a physical transduction technique. They provide a new class of inexpensive, portable instrument that permit sophisticated analytical measurements to be undertaken rapidly at decentralized locations. However, the adoption of biosensors for practical applications other than the measurement of blood glucose is currently limited by the expense, insensitivity and inflexibility of the available transduction methods. Here we describe the development of a biosensing technique in which the conductance of a population of molecular ion channels is switched by the recognition event. The approach mimics biological sensory functions and can be used with most types of receptor, including antibodies and nucleotides. The technique is very flexible and even in its simplest form it is sensitive to picomolar concentrations of proteins. The sensor is essentially an impedance element whose dimensions can readily be reduced to become an integral component of a microelectronic circuit. It may be used in a wide range of applications and in complex media, including blood. These uses might include cell typing, the detection of large proteins, viruses, antibodies, DNA, electrolytes, drugs, pesticides and other low-molecular-weight compounds.
Author (EI)
Bioinstrumentation; Ions; Membranes; Switches; Tissues (Biology)

19970035785
Research strategy for the HPLC/FT-IR analysis of drug metabolites
Pivonka, D. E., Business Unit of Zeneca Inc, USA; Kirkland, K. M.; Applied Spectroscopy; June 1997; ISSN 0003-7028; vol. 51, no. 6, pp. 866-873; In English; Copyright; Avail: Issuing Activity

A strategy for the infrared spectroscopic analysis of drug metabolites in high-pressure liquid chromatography (HPLC) effluent is presented with a primary focus on delivery of metabolite structure as opposed to development of dedicated or automated

instrumentation. This paper stresses the complementary nature of on-line (solution phase) and off-line (condensed phase) HPLC Fourier transform infrared (FT-IR) implementations for structural elucidation of drug metabolites.
Author (EI)
Fourier Transformation; High Pressure; Infrared Spectroscopy; Metabolites

19970036096 Allied-Signal Aerospace Co., Research and Development, Des Plaines, IL USA
Immobilized enzymes in organic media: Chiral monomer production in organic media ***Final Report***
Zemel, H., Allied-Signal Aerospace Co., USA; Bedwell, B. W., Allied-Signal Aerospace Co., USA; Kasper, M., Allied-Signal Aerospace Co., USA; Marinelli, G., Allied-Signal Aerospace Co., USA; Mar. 1996; 33p; In English
Contract(s)/Grant(s): DE-FG36-92CH-10519
Report No.(s): DOE/CH/10519-1; DE97-007722; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The overall goals of this project were to investigate the critical factors that limit commercial scale applications of enzymes in organic solvents, and to scale-up a process for the production of a precursor to a specialty polymer. In the last phase of the project, we focused on optimizing and scaling up a trans-esterification reaction catalyzed by Subtilisin Carlsberg in very dry organic solvent. The reaction system we have employed has been reported. It involves the trans-esterification of vinyl acrylate with (R,S)-sec-(2-naphthyl)ethyl alcohol catalyzed by Subtilisin Carlsberg in tert-amyl-alcohol as a solvent. Only the S ester is produced. The other product, vinyl alcohol, converts spontaneously to acetaldehyde, thus shifting the equilibrium towards production of the desired product. The scaled up reaction was run under various conditions in order to identify the controlling factors. We have been able to scale up successfully the trans-esterification reaction from 5 ml to 75 ml. by varying the immobilization and reaction conditions, we increased the initial rate of the reaction by two orders of magnitude and the conversion from 20% to 100%. We have isolated several grams of the S-sec-(2-naphthyl)ethyl acrylate product. It contains two minor impurities, none of which is the R enantiomer. This and other chiral acrylic monomers could be polymerized to form polymers with special optical properties. In our dry enzymatic trans-esterification system, we found that two factors dominate the observed Subtilisin activity: iyoprotection and water control. This is in agreement with other reports. Our results are consistent with the observed initial rate affected mostly by changes in the amount of active protease rather than in the enzyme's intrinsic catalytic rate.
DOE
Enzymes; Monomers; Acrylates; Ethyl Alcohol; Polymerization; Polymer Chemistry; Synthesis (Chemistry); Catalysis

19970036630
Myoglobin oxygen saturation measured independently of hemoglobin in scattering media by optical reflectance spectroscopy
Arakaki, Lorilee S. L., Univ of Washington, USA; Kushmerick, Martin J.; Burns, David H.; Applied Spectroscopy; June 1996; ISSN 0003-7028; vol. 50, no. 6, pp. 697-707; In English; Copyright; Avail: Issuing Activity

Partial least-squares (PLS) and second-derivative preprocessing were used to obtain estimates of myoglobin oxygen fractional saturation from diffuse reflectance spectra of solutions containing myoglobin, hemoglobin, and a scatterer. A computer model and solutions in vitro were used to simulate several physiological situations. The maximum standard error (SE) was 0.082 for these trials; myoglobin fractional saturation varies between 0 and 1. These results show that a statistical approach can differentiate two highly overlapping absorbance peaks in the presence of diffuse scatter. A robust PLS model was created by using a calibration set with a range of scattering coefficients and concentrations of hemoglobin. Second derivatives of the spectra were less affected by changes in scattering coefficients than were the original spectra. A linear scaling of PLS estimates produced accurate myoglobin saturations from in vitro prediction set spectra that had scattering and absorption coefficients both within and beyond the range represented by the calibration set. Preliminary estimates of myoglobin fractional saturation from spectra acquired from the rat hind limb suggest that this calibration set is appropriate for use in vivo.
Author (EI)
Blood; Gas Analysis; Hemoglobin; Muscles; Oxygen; Ultraviolet Spectroscopy

19970037055
Free energy difference between simple models of B- and Z-DNA: computer simulation and theoretical predictions
Montoro, J. C. Gil, Universidad Complutense de Madrid, Spain; Abascal, J. L. F.; Journal of Chemical Physics; May 15 1997; ISSN 0021-9606; vol. 106, no. 19, pp. 8239-8253; In English; Copyright; Avail: Issuing Activity

The free energy of the transition between the B and Z conformers of DNA has been computed through a thermodynamic route called the setup and charge (SUCH) method. The method divides the 'total' free energy in the electrostatic and nonelectrostatic

contributions. It is shown that the former is considerably more important than the latter one. by using the SUCH method, the main features of the transition are described.
Author (EI)
Chemical Bonds; Computerized Simulation; Deoxyribonucleic Acid; Electrolytes; Free Energy

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19970032197 Army Medical Center, Facilitators of Applied Clinical Trials, Lackland AFB, TX USA
Collaborative Research and Support of Fitzsimmons Army Medical Center Defense Women's Health Research Program Projects: The Effect of Region-Specific Resistance Exercises on Bone Mass in Premenopausal Military Women (Protocol #8) ***Final Report, 1 Feb. 1995 - 30 Jun. 1996***
Mulligan, Hugh L., Army Medical Center, USA; McDermott, Michael T., Army Medical Center, USA; Jun. 30, 1996; 13p; In English
Contract(s)/Grant(s): DAMD17-95-2-5003
Report No.(s): AD-A328885; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The attainment of peak bone mass during the premenopausal years is critical in preventing osteoporosis later in life. The purpose of this study was to determine if peak bone mass can be improved after age 20, the age near which peak bone mass is usually reached, and to compare the effects of region specific resistance exercise with aerobic exercise. Forty three volunteers completed six months of the protocol. Thirty individuals completed twelve months with fifteen in each group. Bone density was shown to significantly increase in the spine, femoral neck and radius by 12 months in both groups. The resistance exercise group had significantly higher densities at the femoral neck and mid-radius at 12 months.
DTIC
Prevention; Osteoporosis; Females; Bones

19970032229 Armstrong Lab., Crew Systems Directorate, Wright-Patterson AFB, OH USA
EEG-Based Control: Neurologic Mechanisms of Steady-State Self-Regulation ***Final Report, Dec. 1992 - Nov. 1996***
Calhoun, Gloria L., Armstrong Lab., USA; McMillan, Grant R., Armstrong Lab., USA; Ingle, David, Logicon Technical Services, Inc., USA; Middendorf, Matthew, Middendorf Technical Services, USA; Feb. 1997; 45p; In English
Contract(s)/Grant(s): F41624-94-C-6000; AF Proj. ILIR
Report No.(s): AD-A328607; AL/CF-TR-1997-0047; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Neural self-regulation is key to successful application of EEG-based control for advanced interface technologies. In the EEG-based interface examined, the magnitude of the steady-state visual evoked response (SSVER) served as a control signal. The SSVER was identified and monitored using non-invasive scalp electrodes and advanced signal processing technology. With biofeedback, subjects learned to increase or decrease the magnitude of their SSVER to an evoking stimulus. These responses were translated into commands that controlled the operation of a physical device or computer program. The objective of this research was to identify some of the neurologic mechanisms involved with neural self-regulation. Using brain electroencephalographic (EEG) and evoked potential (EP) data, the character, timing and neuroanatomical significance of mental operations during task-related processes were examined.
DTIC
Electroencephalography; Neurology; Automatic Control; Biofeedback; Computer Programs; Signal Processing; Cognition

19970032306 China Nuclear Information Centre, Beijing, China
Study on the statistical design for the health evaluation of staffs of the nuclear industry in China over the past 30 years
Zhang Husun, Suzhou Medical Coll., China; Cheng Yiling, Suzhou Medical Coll., China; Zhou Liren, Suzhou Medical Coll., China; Aug. 1996; 9p; In Chinese
Report No.(s): CNIC-01092; SMC-0128.; DE97-614942; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In order to scientifically and objectively evaluate the health and the risk of uranium miners, and the workers involved in radiation, chemical and poisonous substances and not contacting staffs of the nuclear industry in China over the past 30 years, a statistical test program have been developed with FoxBASE(sup +) and FoxPRO For WINDOWS according to computer CPU. The program may be used to test their health and risk instead of previous transmitting of data with the help of the high level computer

language and operation analysis, and the actual work efficiency has been greatly raised. As regard to the program design of database, fault tolerant function, array and macro-substitution technique and Rushmore technique have been established besides setting 130 indexes in 4 large databases and linking the databases with the numbers of the staffs. Therefore, computer algorithm are speeded up.
DOE
Nuclear Radiation; Occupational Diseases; Applications Programs (Computers); Data Bases; Uranium; Fissionable Materials; Radiation Hazards; Operational Hazards

19970033398 Louisiana State Univ., Medical Center, Baton Rouge, LA USA
Myocardial Dysfunction Contributes to Irreversible Hemorrhagic Shock ***Interim Report, 1 Sep. 1996 - 15 Aug. 1997***
McDonough, Kathleen H., Louisiana State Univ., USA; Miller, Harvey I., Louisiana State Univ., USA; Burns, Alastair H., Louisiana State Univ., USA; Aug. 15, 1997; 7p; In English
Contract(s)/Grant(s): N00014-96-I-1274
Report No.(s): AD-A328846; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We have performed a study of the effects of different time periods of hemorrhagic shock on isolated heart function of guinea pigs. In vivo hemodynamics were monitored during hemorrhage, shock and resuscitation and then intrinsic function of the heart was assessed. Three time periods were studied - 1, 2 or 3 hours of shock. In some animals shock lasted for 1 hour and then guinea pigs were resuscitated with whole blood or dextran 70,000 MW (same volume as the blood that was removed). The data collected from the isolated heart indicated that hemorrhagic shock lasting I, 2 or 3 hours by itself did not cause major dysfunction or the heart. The only change in heart function that seemed to occur was in the 3 hour shock group in which the left ventricular compliance was slightly depressed. In annals that had been resuscitated with whole blood or with 6% dextran, ventricular performance was depressed compared to control hearts and compared to hearts from animals in hemorrhagic shock suggesting that reperfusion contributed significantly to myocardial dysfunction resulting from hemorrhagic shock.
DTIC
Myocardium; Hemorrhages; Hemodynamics; Heart Function; Guinea Pigs

19970033418 Chemotherapeutical Research Inst., Frankfurt am Main, Germany
Poly(methyl Methacrylate) (PMMA) and Polylactic Acid Nanoparticles as Adjuvants for Peroral Vaccines, ***26 Sep. 1995 - 28 Feb. 1997***
Kreuter, Jorg, Chemotherapeutical Research Inst., Germany; Mar. 1997; 19p; In English
Contract(s)/Grant(s): DAMD17-95-C-5071
Report No.(s): AD-A328853; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Several studies have shown that especially the small hydrophobic particles accumulate in the Peyer's patches. As a consequence the development of a successful oral vaccine adjuvant may necessitate the use of such small and hydrophobic particles. One of the adjuvant nanoparticles for deglycosylated chain A ricin DGCA vaccine is the acrylate derivative PolyMethyl MethAcrylate (PMMA). In addition to PMMA, PolyLactic Acid (PLA) nanoparticles is evaluated as carrier for DGCA because this material is the prime polymer for sustained release applications. The nanoparticles contain the antigen in adsorbed or incorporated form. In addition PLA nanoparticles are coated with physiologically active substances - polyvinylalcohol or humane serum albumin. The nanoparticles are administered suspended in the following five different liquid vehicles to improve their targeting: PBS (pH 7,4), Miglyol, paraffin, olive oil, polyethylene glycol. In study 1 the five suspension mediums were evaluated with uncoated PMMA containing the adsorbed DGCA. Based on this result in study 2,DGCA was incorporated in the PMMA and suspended in two different liquid vehicles: paraffin and dest water. Study 2 also determined the antiricin IgG induction by administration of incorporated DGCA in PLA nanoparticles coated with human serum albumin or polyvinylalcohol.
DTIC
Methyl Compounds; Vaccines; Examination; Product Development

19970033450 Armstrong Lab., Brooks AFB, TX USA
Whole Body Center of Gravity and Moments of Inertia Study ***Final Report, 15 Dec. 1995 - 31 Dec. 1996***
Schultz, Rebecca B., Armstrong Lab., USA; Obergefell, Louise A., Armstrong Lab., USA; Rizer, Annette, Armstrong Lab., USA; Albery, Christopher B., Armstrong Lab., USA; Dec. 1996; 36p; In English
Contract(s)/Grant(s): MIPR-96MM6643
Report No.(s): AD-A328863; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the inclusion of women in combat aircraft, the question of safe ejection seat operation is raised. The population of combat pilots now includes much smaller ejection seat occupants, which could significantly effect seat performance. The objective

of this study is to measure human whole-body center of gravity (CG) locations and moments of inertia (MOI) on 69 subjects who anthropometrically represent the possible future pilot population (98-245 pounds). A procedure has been developed to measure human whole-body CG and MOI in a seated position using a Space Electronics Mass Properties Instrument. MOI of a subject is measured along six different axes: the three primary axes X (chair on back), Y (chair on right-hand side), and Z (chair upright), and three off-axes positions XY, YZ, and XZ with the chair at a 45 degree angle between the primary axes. Accuracy and repeatability testing have shown this procedure is having approximately 2-5% error. Data collected from this study is being used to validate the Articulated Total Body (ATB) model for use as a predictive tool. In addition, it will be used to provide criteria for use of Air Force and Navy ejection seats by the expanded population.
DTIC
Center of Gravity; Ejection Seats; Fighter Aircraft; Moments of Inertia

19970034933 Armstrong Lab., Wright-Patterson AFB, OH USA
Burn Hazard in Aircraft Fires
Knox, F. S., III, Armstrong Lab., USA; Billotte, Bill, Wright Lab., USA; Ringhand, Stacy, Wright Lab., USA; Sep. 1997; 10p; In English; Also announced as 19970034906; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

Anyone who has seen a burn patient knows that burns are very traumatic, even life threatening, and often require more medical care than any other trauma. Moreover, the physical trauma is just the start; in many cases it is followed by psychological trauma. The psychological trauma can last a lifetime, daily reinforced by the disfigurement which often accompanies severe burns. Burn trauma teams now recognize this and employ psychological specialists who start therapy right along with the medical/physical therapy. All this extensive care costs a great deal of money. For all concerned, the best course is to prevent fires through good design practice. For example, the US Army was able to cut the incidence of burn injuries in survivable crashes to nearly zero by equipping its helicopters with crashworthy fuel systems and having its aviators wear protective flight suits. Part of the justification for that retrofit program was based on the cost of treating burned aviators and training their replacements. The retrofit program turned out to be both the humanitarian and cost effective thing to do. Part of calculating the cost/benefit of proposed fire safety measures is to be able to assess burn hazard with some accuracy. For example, one protective device worn by today's military pilots is their fire retardant flight ensemble. Historically these uniforms were tested in several ways. First, basic simple flammability tests showed which fabrics might be good candidates. The next step was to assess burn protective capability of various fabrics and fabric constructions. This protective capability was assessed by passing ensembles through fuel fires in an outdoor fire pit or by testing fabrics using pigs as aviator surrogates or by using heat flux sensors to measure heat transmitted through the ensemble and then using math models to predict the burn damage. The purpose of this paper is to focus on the burn prediction model, BURNSIM, and discuss its application to the study of fire/thermal sources in aviation. The model was originally developed to replace the use of pigs in testing protective fabrics, but subsequently has been applied to other cases such as side-by-side ejection seats, live fire testing and aerothermal heating during high MACH escape. Each of these applications will be discussed after presenting the burn model in some detail.
Derived from text
Aircraft Safety; Burns (Injuries); Fires; Flame Retardants; Flammability; Mathematical Models; Safety Devices; Flight Clothing; Fire Prevention

19970035489
Consideration of the method of image diagnosis with respect to frontal lobe atrophy
Sato, K., Akita Univ, Japan; Sugawara, K.; Narita, Y.; Namura, I.; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3230-3239; In English; Copyright; Avail: Issuing Activity

This paper proposes a segmentation method for a quantitative image diagnosis as a means of realizing an objective diagnosis of the frontal lobe atrophy. From the data obtained on the grade of membership, the fractal dimensions of the cerebral tissue (left bracket) cerebral spinal fluid (CSF), gray matter, and white matter(right bracket) and the contours are estimated. The mutual relationship between the degree of atrophy and the fractal dimension has been analyzed based on the estimated fractal dimensions. Using a sample of 42 male and female cases, ranging in age from 50's to 70's, it has been concluded that the frontal lobe atrophy can be quantified by regarding it as an expansion of CSF region on the magnetic resonance imaging (MRI) of the brain. Furthermore, when the process of frontal lobe atrophy is separated into early and advanced stages, the volumetric change of CSF and white matter in frontal lobe displays meaningful differences between the two stages, demonstrating that the fractal dimension of CSF rises with the progress of atrophy. Moreover, an interpolation method for three-dimensional (3-D) shape reconstruction of

the region of diagnostic interest is proposed and 3-D shape visualization, with respect to the degree and form of atrophy, is performed on the basis of the estimated fractal dimension of the segmented cerebral tissue.
Author (EI)
Brain; Diseases; Fractals; Image Analysis; Imaging Techniques; Magnetic Resonance

19970035495
Evaluation of the effects of patient arm attenuation in SPECT cardiac perfusion imaging
Luo, Dershan, Univ of Massachusetts Medical Cent, USA; King, Michael A.; Pan, Tin–Su; Xia, Weishi; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3291-3299; In English; Copyright; Avail: Issuing Activity

It was hypothesized that the use of attenuation correction could compensate for degradation in the uniformity of apparent localization of imaging agents seen in cardiac walls when patients are imaged with arms at their sides. Noise-free simulations of the digital MCAT phantom were employed to investigate this hypothesis. Four variations in camera size and collimation scheme were investigated. We observed that: 1) without attenuation correction, the arms had little additional influences on the uniformity of the heart for 180 deg reconstructions and caused a small increase in nonuniformity for 360 deg reconstructions, where the impact of both arms was included; 2) change in patient size had more of an impact on count uniformity than the presence of the arms, either with or without attenuation correction; 3) for a low number of iterations and large patient size, slightly better uniformity was obtained from parallel emission data than from fan-beam emission data, independent of whether parallel or fan-beam transmission data was used to reconstruct the attenuation maps; and 4) for all camera configurations, uniformity was improved with attenuation correction and, given sufficient number of iterations, it was compatible among different imaging geometry combinations. Thus, iterative algorithms can compensate for the additional attenuation imposed by larger patients or having the arms on the sides. When the arms are at the sides of the patient, however, a larger radius of rotation may be required, resulting in decreased spatial resolution.
Author (EI)
Cardiovascular System; Computer Aided Tomography; Electromagnetic Wave Transmission; Imaging Techniques; Medical Equipment; Wave Attenuation

19970035501
Measurement of blood vessel characteristics for disease detection based on cone-beam CT images
Kawata, Yoshiki, Univ of Tokushima, Japan; Niki, Noboru; Kumazaki, Tatsuo; IEEE Transactions on Nuclear Science; December 1996; ISSN 0018-9499; vol. 43, no. 6 Pt 2, pp. 3348-3354; In English; Copyright; Avail: Issuing Activity

This paper presents a method of measurement of blood vessel characteristics for disease detection based on cone-beam CT images. The important objective here is to show how representation of blood vessel morphology can lead to feature measurement and identification of abnormal regions. We represent the blood vessel surface through curvatures and then measure the surface characteristics that emphasize disease such as aneurysm and stenosis. From results of an application to a patient's abdominal blood vessels containing two aneurysms and one stenosis, we show the feasibility of our method to direct the physician's attention to the location of the abnormality.
Author (EI)
Blood Vessels; Computer Aided Tomography; Diseases; Radiography

19970037220
Currents and electric fields induced in the human body when the arms are raised
King, Ronold W. P., Harvard Univ, USA; Journal of Applied Physics; June 1 1997; ISSN 0021-8979; vol. 81, no. 11, pp. 7116-7128; In English; Copyright; Avail: Issuing Activity

A method for computing currents and electric fields in the human body when the arms are raised is presented. The analysis provides complete insight into the currents induced in the body including the arms. The current densities and electric fields in the different organs can be determined. The total current is a superposition of transverse and longitudinal currents, so that the described procedure for determining the fraction of the total current in individual organs does not apply close to the junction.
Author (EI)
Bioelectric Potential; Electric Current; Electromagnetic Fields; Human Body; Physiology

53
BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19970032290 Armstrong Lab., Aerospace Mecicine Directorate, Brooks AFB, TX USA
Using the NEO-PI-R to Assess the Personality of US Air Force Pilots ***Interim Report, Aug. 1996 - Jul. 1997***
Callister, Joseph D., Armstrong Lab., USA; King, Raymond E., Armstrong Lab., USA; Retzlaff, Paul D., Armstrong Lab., USA; Marsh, Royden W., Armstrong Lab., USA; Jul. 1997; 20p; In English
Report No.(s): AD-A328908; AL/AO-TR-1997-0097; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The study of pilot personality has a long and controversial history. Personality characteristics are fairly poor predictors of training completion, but are probably better predictors of operational performance. Personality characteristics are also important considerations in clinical psychological assessment. The current paper describes the personality characteristics of 1301 US Air Force students pilots based on the NEO Personality Inventory (NEO-PI-R). Compared to male adult norms, male student pilots had higher levels of extraversion and lower levels of agreeableness. Compared to female adult norms, female student pilots had higher levels of extraversion and higher levels of openness as well as lower levels of agreeableness. Percentile tables for the five domain scores and 30 facet scales are provided and discussed for clinical use. A case study is also provided as an example of the clinical utility of these US Air Force norms.
DTIC
Aircraft Pilots; Human Performance; Personality

19970033223 Washington State Univ., Pullman, WA USA
The Development of Patterns of Commitment: Implications for Performance ***Final Report, Aug. 1993 - Nov. 1995***
Becker, Thomas E., Washington State Univ., USA; Billings, Robert S., Ohio State Univ., USA; May 1997; 68p; In English
Contract(s)/Grant(s): MDA903-93-K-0019
Report No.(s): AD-A328692; ARI-RN-97-13; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report provides the results of four studies of the relationship among certain dispositional variables, cognitive factors, employee commitment, intentions, and performance. Study 1 developed measures of attachment styles, Study 2 examined the relationships between personality factors (including attachment styles) and job attitudes, Study 3 demonstrated that attachment styles and motivation to commit predict organizational commitment, and Study 4 established that certain forms of commitment predict employee performance. Conclusions and recommendations are presented for each study.
DTIC
Cognition; Human Performance

19970033340 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
ASVAB Correlations Are Lower for Higher Aptitude Groups ***Final Report, Sep. 1995 - Jun. 1996***
Legree, Peter J., Army Research Inst. for the Behavioral and Social Sciences, USA; Pifer, Mark E., Army Research Inst. for the Behavioral and Social Sciences, USA; Grafton, Frances C., Army Research Inst. for the Behavioral and Social Sciences, USA; Jan. 1997; 20p; In English
Report No.(s): AD-A328529; ARI-TR-1053; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Previous research demonstrates that correlations among IQ tests are lower when estimated using higher scoring individuals. However, this phenomenon has only been documented using individually administered measures of intelligence, and attempts to extend the demonstration to other specialized aptitudes have failed. The present study divides the 1980 Armed Services Vocational Aptitude Battery (ASVAB) weighted norming sample into five aptitude levels with similar levels of variance. Analyses show that the ASVAB tests are less correlated within higher aptitude groups provided that the scales used to define the groups are psychometrically sound: for three highly skewed ASVAB tests, a ceiling effect prevents this phenomenon; for the remaining seven tests the phenomenon replicates; and the magnitude of the effect is proportional to the skewness of the scale, r = 0.85. These findings support the assertion that cognitive aptitudes are less correlated in higher aptitude groups, imply that greater classification effects can be associated with higher scoring groups, and qualify the use of the multivariate correction for restriction of range.
DTIC
Intelligence; Aptitude; Intelligence Tests; Armed Forces (USA)

19970033348 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
An Additional Metric for Communicating Group Performance Differences ***Final Report, Jan. - Jun. 1995***
Silva, Jay M., Army Research Inst. for the Behavioral and Social Sciences, USA; Feb. 1997; 21p; In English

Contract(s)/Grant(s): DA Proj. 2O4-65803-D-730
Report No.(s): AD-A328532; ARI-TR-1055; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The common practice of expressing group performance differences in standard deviation units conveys useful but limited information. Reporting the percentage of the time a member from a lower performing group is expected to outperform a member from a higher performing group would enhance understanding of the magnitude of the difference. Furthermore, the proposed percentage metric is able to easily deal with group variability differences in addition to mean group differences. An analytical approach was used to convert group performance differences from standard deviation units to the proposed metric. The slope of the relationship between the two metrics is nearly linear through a one standard deviation group performance difference. Tables are presented that can be used to convert group performance differences in standard deviation units to the new metric.
DTIC
Group Dynamics; Human Performance; Variability

19970033396 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
Using Psychomotor Ability for Selecting TOW Gunners ***Final Report, Sep. 1993 - Feb. 1996***
Silva, Jay M., Army Research Inst. for the Behavioral and Social Sciences, USA; Mar. 1997; 30p; In English
Contract(s)/Grant(s): DA Proj. 203-63007-A-792
Report No.(s): AD-A328697; ARI-TR-1059; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research examined the incremental validity of a psychomotor tracking test when added to traditional Army measures of cognitive ability. In addition, the actual gunnery performance of 911 TOW Gunners assigned with current procedures from a pool of 10,852 Infantrymen was compared to the predicted performance of 911 TOW Gunners hypothetically assigned on the basis of general cognitive ability (g) and tracking ability. Increments in validity resulting from the use of the tracking test were found, although the magnitude of the increases were smaller than expected. However, the increments resulting from hypothetical assignment using tracking test were substantial. Whether TOW Gunner performance prediction was based on g. tracking score or both top down hypothetical assignment of Infantrymen as TOW Gunners resulted in a significant improvement in predicted TOW Gunner gunnery performance and successful completion of training. If assignment as a TOW Gunner was based on tracking ability and was made from the full applicant pool rather than from those first assigned as Infantrymen. It is likely that TOW Gunner performance could be improved with no loss in performance in other military occupations. This is true even if gunner performance in other Infantry occupations also depends on tracking ability. Implications for classification and job clustering are discussed.
DTIC
Performance Prediction; Mental Performance; Classifications

19970033456 California Univ., Dept. of Psychology, Los Angeles, CA USA
Feedback for Skill Acquisition: Preliminaries to a Theory of Feedback ***Final Report, 1985 - 1989***
Schmidt, Richard A., California Univ., USA; May 1997; 71p; In English
Contract(s)/Grant(s): MDA903-85-K-0225
Report No.(s): AD-A328695; ARI-RN-97-11; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In training for skills, feedback about skill proficiency termed knowledge of results (KR) in the laboratory is critical to efficient learning. But, while various manipulations of KR in acquisitions can provide immediate benefits for performance, these may disappear in retention tests. In several paradigms, we show that (compared to feedback after each trial) making feedback less useful by giving it less frequently, or by summarizing or averaging it after several trials, degrades performance in acquisition, but produces superior learning as measured on retention or transfer tests. Preliminaries to a guidance theory are proposed on retention or transfer tests and are proposed to account for these effects. In this view, frequent feedback has various negative effects that degrade retention, such as (a) the encouragement of maladaptive short term corrections that disrupt response stability, and (b) the blockage of information processing activities that lead to the learning of error detection capabilities. Practical implications of these concepts for Army training procedures are discussed.
DTIC
Data Processing; Correction; Feedback

19970034833 Knowledge Based Systems, Inc., College Station, TX USA
General Aviation Pilot Advisory and Training System (GAPATS) ***Semiannual Report, 26 Jan. - 25 Jul. 1997***
Painter, John, Knowledge Based Systems, Inc., USA; Ward, Donald T., Knowledge Based Systems, Inc., USA; Kelly, Wallace, Knowledge Based Systems, Inc., USA; Crump, John W., Knowledge Based Systems, Inc., USA; Phillips, Ron, Knowledge Based Systems, Inc., USA; Trang, Jeff, Knowledge Based Systems, Inc., USA; Lee, Kris, Knowledge Based Systems, Inc., USA; Branham, Paul A., Knowledge Based Systems, Inc., USA; Krishnamurthy, Karthik, Knowledge Based Systems, Inc., USA; Alcorn,

William P., Jr., Knowledge Based Systems, Inc., USA; Robbins, Andrew P., Knowledge Based Systems, Inc., USA; Yu, Ren–Jye, Knowledge Based Systems, Inc., USA; Sep. 16, 1997; 36p; In English
Contract(s)/Grant(s): NAS1-20593
Report No.(s): NASA/CR-97-205852; NAS 1.26:205852; GAPATS/PROGRESS/972501-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project is to achieve a validated General Aviation Pilot Advisor and Training System (GAPATS) engineering prototype, implemented according to commercial software standards and Federal Aviation Administration (FAA) issues of certification. Phase 2 builds on progress during Phase 1, which exceeded proposed objectives. The basic technology has been transferred from previous NASA research (1989 to 1994). We anticipate a commercially licensable prototype, validated by pilots in a flight simulator and in a light twin-engine research aircraft for FAA certification, by January 1998.
Derived from text
Pilot Training; Prototypes; Computer Programs; General Aviation Aircraft; Research Aircraft; Flight Simulators; Systems Engineering

19970034935 Oklahoma Univ., School of Industrial Engineering, Norman, OK USA
Use of Object Oriented Programming to Simulate Human Behavior in Emergency Evacuation of an Aircraft's Passenger Cabin
Court, Mary C., Oklahoma Univ., USA; Marcus, Jeffrey H., Civil Aeromedical Inst., USA; Sep. 1997; 8p; In English; Also announced as 19970034906; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The paper presents an object-oriented framework to model human behavior under both certification and accident evacuations. The framework opens up a new area of analysis by proposing a paradigm for predicting human behavior. Object oriented programming lends itself to the modeling of complex systems by supporting a one-to-one correspondence with the physical world, and thus, eases the burden of model validation. Easing model validation is of particular importance when the real-system's environment is hazardous, and performing tests on the real-system is either impossible or not repeatable.
Author
Evacuating (Transportation); Emergencies; Human Behavior; Passengers; Aircraft Safety; Passenger Aircraft; Object-Oriented Programming; Mathematical Models; Safety Factors; Complex Systems

19970034936 Cranfield Univ., Dept. of Applied Psychology, Bedford, UK
Passenger Protection and Behaviour
Muir, H. C., Cranfield Univ., UK; Cobbett, A., Cranfield Univ., UK; Sep. 1997; 6p; In English; Also announced as 19970034906; Copyright Waived; Avail: CASI; A02, Hardcopy; A03, Microfiche

The world-wide accident statistics indicate that the number of accidents has decreased over the last two decades. Unfortunately, the dramatic reduction in the overall accident rate was accompanied by a less dramatic reduction in the fatality rate of those onboard an aircraft which is involved in an accident. Nevertheless, recent analyses conducted by the FAA have indicated that fire has become less of a risk; in survivable accidents. In the early 1980s, FAA attributed 40 percent of fatalities in survivable accidents to fire effects. A review of US airline accidents that occurred between 1985 and 1991 showed that approximately 10 percent of fatalities were related to fire. Whilst no two accidents can be the same, it is possible to learn from the similarities and difference between the cause of the accidents, their location, and the environmental condition present, the types of passengers onboard and their responses to the emergency. There are a great many questions which as yet we are not able to answer about the behaviour of people in emergencies, including the important question of why in some accidents the passengers evacuate in an orderly manner, and in other accidents the behaviour is disorderly. This paper discusses an evacuation technique that has a potential to provide both the behavioural and statistical data required for assessment of design options or safety procedures for use in emergency evacuations.
Derived from text
Passengers; Human Behavior; Evacuating (Transportation); Aircraft Safety; Flight Crews

19970034937 Greenwich Univ., Fire Safety Engineering Group, London, UK
The Role of Evacuation Modelling in the Development of Safer Air Travel
Galea, E. R., Greenwich Univ., UK; Owen, M., Greenwich Univ., UK; Lawrence, P., Greenwich Univ., UK; Sep. 1997; 14p; In English; Also announced as 19970034906; Copyright Waived; Avail: CASI; A03, Hardcopy; A03, Microfiche

Computer based mathematical models describing the aircraft evacuation process have a vital role to play in the design and development of safer aircraft, in the implementation of safer and more rigorous certification criteria and in post mortuum accident investigation. As the risk of personal injury and costs involved in performing large-scale evacuation experiments for the next gen-

eration Ultra High Capacity Aircraft (UHCA) are expected to be high, the development and use of these evacuation modeling tools may become essential if these aircraft are to prove a viable reality. In this paper the capabilities and limitations of the air-EXODUS evacuation model are described. Its successful application to the prediction of a recent certification trial, prior to the actual trial taking place, is described. Also described is a newly defined parameter known as OPS which can be used as a measure of evacuation trial optimality. Finally, the data requirements of aircraft evacuation models is discussed along with several projects currently underway at the University of (Greenwich designed to obtain this data. Included in this discussion is a description of the AASK - Aircraft Accident Statistics and Knowledge - data base which contains detailed information from aircraft accident survivors. Author

Mathematical Models; Evacuating (Transportation); Aircraft Design; Aircraft Safety; Aircraft Accidents; Air Transportation

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19970032332 Army Aeromedical Research Lab., Aircrew Health and Performance Div., Fort Rucker, AL USA

A Helicopter Simulator Assessment of Pilot Head Movement During Various Phases of Flight ***Final Report***

Braithwaite, Malcolm G., Army Aeromedical Research Lab., USA; Alvarez, Eduardo A., Army Aeromedical Research Lab., USA; Jones, Heber D., Army Aeromedical Research Lab., USA; Higdon, Alford A., Army Aeromedical Research Lab., USA; Groh, Shannon L., Army Aeromedical Research Lab., USA; Beal, Kathleen G., Wright State Univ., USA; Estrada, Arthur, Hughes Technical Center, USA; Jul. 1997; 65p; In English

Contract(s)/Grant(s): DA Proj. 3M1-62787-A-879

Report No.(s): AD-A328486; USAARL-97-26; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The opto-kinetic cervico reflex (OKCR) is a recently hypothesized visually driven reflex that serves to stabilize the image of the external horizon on the retina during high performance aircraft roll maneuvers. Although anecdotally reported as occurring, head tilt during helicopter flight has not been formally studied. Such research is required to determine the full impact and significance it may have on a rotary wing aviator's flying performance. The aim of this study was to investigate the relationship between horizon position and perception of orientation, and thus generate vital information to assess whether this reflex plays an important role in spatial disorientation. Twenty volunteer pilots participated in a UH-60 flight simulator study to examine the effects of this reflex. The results confirm that the OKCR occurs during simulated helicopter flight, both with and without night vision goggles. As with previous studies, head roll increased during flight under visual meteorological conditions in relation to increasing aircraft roll angle up to a maximum sustainable level and then remained constant. Head roll did not occur during flight under instrument meteorological conditions. Various aspects that impact rotary-wing operations are discussed, and recommendations made for future research.

DTIC

Flight Simulators; Helicopters; Head Movement; Reflexes; Night Vision; Aircraft Pilots; Disorientation; Flight Conditions

19970032337 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

Extended Use of Night Vision Goggles: An Evaluation of Comfort for Monocular and Biocular Configurations ***Final Report***

CuQlock–Knopp, V. G., Army Research Lab., USA; Sipes, Dawn E., Johns Hopkins Univ., USA; Torgerson, Warren, Johns Hopkins Univ., USA; Bender, Edward, Army Communications-Electronics Command, USA; Merritt, John O., Interactive Technologies, USA; McLean, William, Army Aeromedical Research Lab., USA; Myles, Kimberly, Army Research Lab., USA; Jul. 1997; 59p; In English

Contract(s)/Grant(s): DA Proj. 1L1-61102-B-74-A

Report No.(s): AD-A328485; ARL-TR-1427; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Forty-four military participants were tested in a field experiment to compare the relative discomfort experienced when monocular versus biocular Night Vision Goggles (NVGs) were worn for an extended period of time. Participants traversed wooded terrain to reach various stations where they performed a variety of military and field craft tasks. The total test time was 4 hours. The participants rated their psychological and physiological feelings of discomfort at the completion of the test and again the following evening. Objective measures of NVG optical adjustments were also recorded. The participants who wore the biocular goggle reported a higher incidence of tight neck muscles than did the participants who wore the monocular goggle. However, no

other significant differences in discomfort were found that could be attributed to the ocular configuration of the goggles. All participants complained about discomfort from the head harness.
DTIC
Night Vision; Goggles; Evaluation; Comfort; Display Devices

19970033302 New Energy and Industrial Technology Development Organization, Tokyo, Japan
Leading research in FY 1995: Research of product evaluation and advanced measurements, Part 1, Product Evaluation
1995 nendo sendo kenkyu: Seihin hyoka kodo keisoku bunseki gijutsu ni kansuru chosa kenkyu, 1, Seihin Hyoka
Mar. 1996; 217p; In Japanese
Report No.(s): NEDO-PR-9506-1; DE97-745147; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Product evaluation has been investigated from a viewpoint of compatibility with human life by considering human being as the subject of life. This report describes the investigation results. Product evaluation is defined as evaluating products from a consumer-oriented viewpoint and informing consumers of the evaluation results. According to a questionnaire survey with regard to daily living products, products in the low degree of satisfaction in their usage were electric tooth brush, video camera, electric rice jar, vacuum cleaner, and electric iron. Contents of dissatisfaction with these products were classified by aspect, i.e., human aspect regarding human body/recognition, life aspect regarding functions of products and how to use them, and sensitivity aspect such as appearance of products. As regards the human aspect, incompatibility between the size/form of products and human body/posture, and recognition psychological incompatibility such as difficulty in understanding function or operation of products were pointed out. Establishment of a method for measuring and evaluating the human's body functions and the compatibility with products, and necessity of the acquisition of human's body characteristic data and the consolidation positions are also described.
DOE
Cameras; Human Factors Engineering; Compatibility; Human Body; Electric Equipment

19970033506 Naval Postgraduate School, Monterey, CA USA
Immersive Articulation of the Human Upper Body in a Virtual Environment
Skopowski, Paul F., Naval Postgraduate School, USA; Dec. 1996; 241p; In English
Report No.(s): AD-A286926; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This thesis addresses the problem that virtual environments (VE's) do not possess a practical, intuitive, and comfortable interface that allows a user to control a virtual human's movements in real-time. Such a device would give the user the feeling of being immersed in the virtual world, greatly expanding the usability of today's virtual environments. The approach was to develop an interface for the upper body, since it is through this part of users' anatomy that they interact most with their environment. Lower body motion can be more easily scripted. Implementation includes construction of a kinematic model of the upper body. The model is then manipulated in real-time with inputs from electromagnetic motion tracking sensors places on the user. Research resulted in an interface that is easy to use and allows its user limited interaction with a VE. The device takes approximately one sixth the time to don and calibrate as do mechanical interfaces with similar capability. It tracks thirteen degrees of freedom. Upper body position is tracked, allowing the users to move through the VE. Users can orient their upper body and control the movements of one arm. Uncorrected position data from two trackers was used to generate clavicle joint angles. Difficulty in controlling figure motion indicates that the sensors used lack sufficient registration for this purpose. Therefore, the interface software uses only orientation data for computing joint angles.
DTIC
Computerized Simulation; Virtual Reality; Interfaces; Human Body; Real Time Operation; Computer Systems Programs; Calibrating; Anatomy

19970034574 NASA Marshall Space Flight Center, Huntsville, AL USA
International Space Station Program Phase 3 Integrated Atmosphere Revitalization Subsystem Test *Final Report*
Perry, J. L., NASA Marshall Space Flight Center, USA; Franks, G. D., NASA Marshall Space Flight Center, USA; Knox, J. C., NASA Marshall Space Flight Center, USA; Aug. 1997; 172p; In English
Report No.(s): NASA-TM-108541; NAS 1.15:108541; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Testing of the International Space Station (ISS) U.S. Segment baseline configuration of the Atmosphere Revitalization Subsystem (ARS) by NASA's Marshall Space Flight Center (MSFC) was conducted as part of the Environmental Control and Life Support System (ECLSS) design and development program. This testing was designed to answer specific questions regarding the control and performance of the baseline ARS subassemblies in the ISS U.S. Segment configuration. These questions resulted from the continued maturation of the ISS ECLSS configuration and design requirement changes since 1992. The test used pressurized

oxygen injection, a mass spectrometric major constituent analyzer, a Four-Bed Molecular Sieve Carbon Dioxide Removal Assembly, and a Trace Contaminant Control Subassembly to maintain the atmospheric composition in a sealed chamber at ISS specifications for 30 days. Human metabolic processes for a crew of four were simulated according to projected ISS mission time lines. The performance of a static feed water electrolysis Oxygen Generator Assembly was investigated during the test preparation phases; however, technical difficulties prevented its use during the integrated test. The Integrated ARS Test (IART) program built upon previous closed-door and open-door integrated testing conducted at MSFC between 1987 and 1992. It is the most advanced test of an integrated ARS conducted by NASA to demonstrate its end-to-end control and overall performance. IART test objectives, facility design, pretest analyses, test and control requirements, and test results are presented.
Author
Environmental Control; Life Support Systems; International Space Station; Subassemblies; Atmospheric Composition; Oxygen; Carbon Dioxide Removal; Performance Tests

19970034860 Helsinki Univ. of Technology, Lab. of Structural Engineering and Building Physics, Espoo, Finland
The Second Cooperation Symposium in Building Physics between Chongqing Jianzhu University of China and Helsinki University of Technology of Finland
Yongling, W., Helsinki Univ. of Technology, Finland; Qigao, C., Helsinki Univ. of Technology, Finland; Dec. 1996; 86p; In English; 2nd; Cooperation Symposium in Building Physics between Chongqing Jianzhu University of China and Helsinki University of Technology of Finland, 16-25 Sep. 1996, Chongqing, China
Report No.(s): PB97-171342; Copyright Waived; Avail: CASI; A05, Hardcopy; A01, Microfiche

The paper contains the following topics: Summary of Building Physics Research in Helsinki University of Technology; Capillary Moisture Transfer in Masonry; Building Physics Questions in Finnish House Repair; Hygroscopic Moisture Behavior of Plywood; Introduction to Building Physics Research Work in Chongqing Jianzhu University and Questions in Building Dehumidification Elements; Optimizing Air Quality and Climate in a Courtyard; Experimental Study of Thermal Climate of A'Underground Dwelling with Ventilation and Dehumidification; Temperature Distribution in Corners of External Walls: A Simplified Approach; Experimental Research on the Passive Dehumidifying Solar House; and Laboratory Report on Passive Dehumifying Solar House and Ordinary House.
NTIS
Conferences; Buildings; Environmental Engineering; Construction Materials

Subject Term Index

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